

Upper mantle structure under the Baikal rift zone inferred from receiver function and seismic tomography analyses

Tomofumi Inoue[1]; Dapeng Zhao[2]; Akira Yamada[3]; Jianshe Lei[2]

[1] Biology and Earth Sci., Ehime Univ; [2] GRC, Ehime Univ; [3] GRC, Ehime Univ.

The origin of the Baikal rift zone (BRZ) is still unclear. Two possibilities are suggested; (1) active formation due to an upwelling of a mantle plume beneath the BRZ and (2) passive formation associated with the collision between the Indian and the Eurasia plates. In this study, we use data recorded by a portable seismic network (Gao et al., 1994). Both topography of the upper mantle discontinuities (410 and 660 km) and 3-D velocity structure of the upper mantle are estimated by using these two methods. The aim of this study is to estimate the upper mantle structure beneath the BRZ, which is not well studied so far, to clarify the origin of the BRZ.

The data set used here is from earthquakes with magnitude greater than 4.9 and with epicentral distance of 30-90 degrees. About 1000 P arrivals from 63 teleseismic events recorded by the portable seismic network are used in the seismic tomography. About 500 receiver functions are obtained from 63 events recorded by the network and two permanent IRIS stations.

The results are as follows; (1) A high-velocity anomaly exists beneath north of the BRZ, which may represent the cold Siberian platform; (2) a low-velocity anomaly is found just beneath the BRZ to a depth of 500 km; and (3) both 410 and 660 km discontinuities deepen from the south to the north. The results indicate that the low-velocity anomaly from the surface to the 500 km depth may show an upwelling plume. Also inferred is that the plume may have its origin in the mantle transition zone, not in the lower mantle.

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